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VOLUME I – PHASE IIA TOPICAL REPORT

Phase IIA - Full scale Regenerable HEPA Filter System Design

Phase IIA is comprised of the following sections:
1. Full scale RHFS design
2. Full scale HEPA Filter Element delivery
3. Acceptance Test Plan
4. Final Technical Report

Section 1
The design for the Full Scale RHFS filter system is complete per the original Mott scope. The request for proposal issued on April 26, 2002 is different than what we were working on. The proposal requested a price on an integrated system combining the Mott metal Filter with the existing H&V skid presently used by DOE for filtration of the waste tank exhaust air.

The H&Vskid has been modified to incorporate the Mott metal filter and all the associated commercial items have been requoted to perform to the new requirement of a higher flowrate. The new skid is shown in the Mott drawing SK2587. The major change was the re-enforcement of the glass HEPA filter housing so that it could perform under a vacuum of 9" Hg and a change in the blower to provide the 1000 CFM specified.

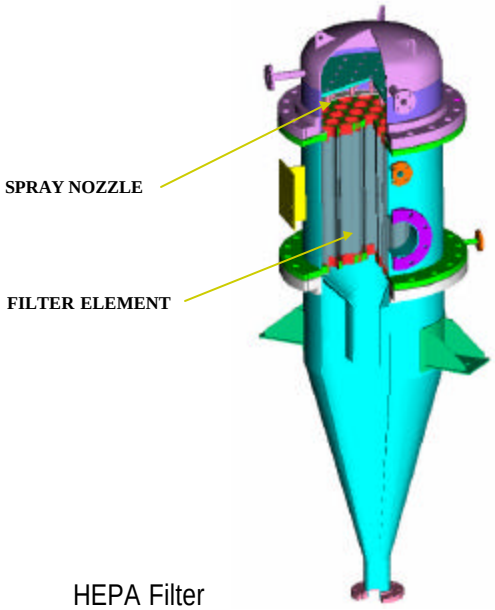
The Filter System Skid design is complete per specification M-SPP-G-00300, Rev 0.
and is comprised of the following components:

1. One Koch-Otto York Demister style 194, 304SS mesh with 304SS top and bottom rigid weld grids. All contained in a 304SS, 20" Dia x 10'-4" tall housing.

2. One Aerofin Type B non-freeze Steam Heating Coil. Model number BNF-14AE-29.0 x 24.0-1-1. Contained in an assembly housing of 304SS with dimensions of 34" x 34" and transitions to 10" Dia for both inlet and outlet.

3. One Mott HyPulse GSM Filter System, catalog number XX2422-48-2.25-1-HDD. The design of the housing/vessel is complete. The design is per ASME section VIII, division 1 and the vessel is code stamped. The filter contains forty-eight (48) filter elements 2 ¼" diameter by 22" long, but the housing diameter has been kept at 24". This is due to the smaller diameter of the new element. The new design provides 51 square feet of filtering surface area. Construction materials are stainless steel and Nickel; the filter elements being Nickel. The filter media is Mott precision porous metal rated according to Mott common practice. The housing includes a spray nozzle manifold for contacting the element inside surface. Blowback gas is introduced into the clean side of the vessel for reverse flow.

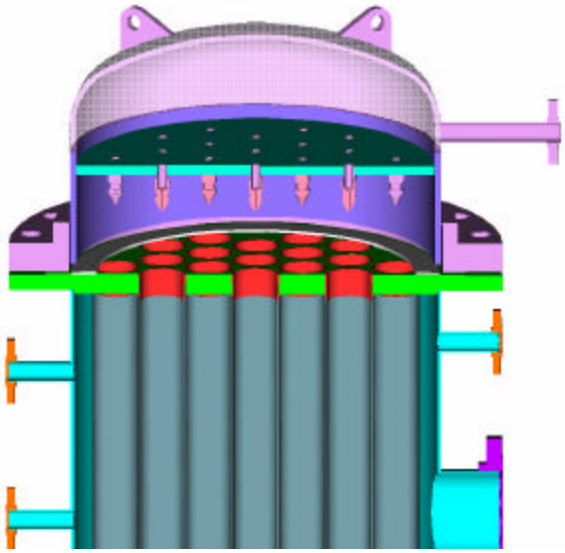
4. In addition, the inlet and outlet have increased from the original 6" dia inlet to a 10" dia inlet. This was done to allow for the increase in flow from the original 400 CFM to the current 1000 CFM. The drain has also been increased from the original 4" dia to the current 6" dia. This is due to the increase in surface and the resulting increase in dirt holding capacity. In the following HEPA Filter, Fig 1, the design of the filter vessel can be seen. It shows the location of the elements, the conical bottom where the inlet to the filter is located, the drain which empties into the HLWT. In addition, the modular design is clearly visible and shows the center section that may be removed for element change out.



HEPA Filter

Fig 1

The nozzles for washing the inside of the elements remain the same model and a new series of manifolds have been added to account for the additional elements. Fig 2 shows the alignment of the nozzle to the elements.



Nozzle Location

Fig 2

5. One Flanders HEPA filter model number BG1-2H1W-2GGF-304-D3 with Pureform filter elements.

6. One Gardner-Denver SutorBilt positive displacement vacuum blower model 6LP. Rated for 1000 CFM at 9" Hg.

7. Two, 10" dia manual valves. One for the inlet and one for the outlet.

8. One, 6" dia manual valve for the drain. The drain will empty into the waste tank.

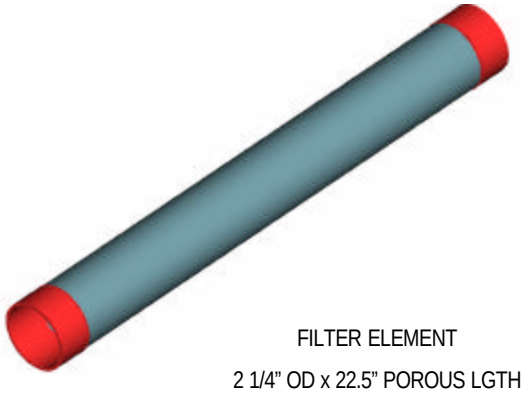
9. Two Rosemont pressure transmitters for indication of terminal pressure drop. One instrument located upstream and one down stream.

10. All piping, lighting fixtures, insulation and labeling

11. The entire system is mounted on a 7' wide x 23' long frame. The electrical control boxes are also included in this envelope dimension.

Section 2

The original element chosen was a 3" dia Nickel element, but this has proven to have a high-pressure drop. The average pressure drop ranges from 70 – 80" WC at a flow of 30 CFM. This higher pressure drop is a direct result of the manufacturing process. Since the diameter is 3" dia, in order to achieve proper mechanical strength and avoid premature collapse, the media has to be compacted using a higher pressure. In addition, the cleaning of the elements is a concern. With the denser wall, back pulsing using air is not nearly as effective as desired. This could lead to plugged filters and reduced cycle times. In order to improve this situation, a new element has been chosen for the filter system. The new filter is a 2 ¼" dia x 22" long porous Nickel product. Fig 3 illustrates the design of the element and shows the double open-ended construction.



FILTER ELEMENT

2 1/4" OD x 22.5" POROUS LGTH

Fig 3

This was a filter used back in October, 200 with positive results. The pressure drop data for this product is shown in Table 1.

Table 1

Flow CFM	P in W.C.	Delta P W.C.	SCFM	Vel - FPM
14.8	27.3	27.3	13.81	13.41
25.26	46.4	45.7	22.38	21.73
30.96	56.2	55	26.68	25.9
36.7	65.9	63.9	30.76	29.86
42.6	75.4	72.6	34.71	33.69
48.4	84.4	80.8	38.36	37.24

As indicated in the table, the pressure drop at 30 CFM is 55" W.C. as compared to 70 – 80" W.C. for the 3" dia element. This has prompted a change in design to the new element.
The design velocity for the filter system is 20 FPM, which yields a clean pressure drop of about 42" W.C. or 1.5 psi.

In addition, there is some data that seems to indicate that cleaning is easier with the smaller diameter element. This has to be confirmed in the lab.

The 2 ¼" dia element has been tested by an independent lab and confirmed to meet HEPA standard.

Section 3
The acceptance test plan has not been completed as we are awaiting data from DOE on the conditions of the tanks. Once this is received, a test plan can be developed.

Section 4
The final technical report has not been completed per the new proposal. The change in scope from a Mott HyPulse filter to an H&V skid system was fairly recent and no report has submitted detailing the new design.